

HABITAT PREFERENCES AND DISTRIBUTIONAL STATUS OF SOME FOREST BIRDS IN ANDAMAN ISLANDS¹

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The habitat preferences of 30 species of forest birds were studied in Baratang Island in the Andamans, India. The relationship between habitat preferences and large-scale patterns, such as biogeographical distribution of each species on the continent of Asia and distributional status within the Andaman Islands was analysed. The birds fell into five categories, those found predominantly in only one habitat type, evergreen or deciduous forest, and those which used a broader range of habitats, which were classified on the basis of their relative occurrence in each habitat type as semi-evergreen, moist deciduous or generalist species. The habitat preferences of these 30 species showed no association with either the biogeographical distribution or with status, suggesting that large-scale distributional patterns are not related to habitat preferences.

INTRODUCTION

Within a geographical area, species are not evenly distributed across all available habitats, but tend to use some habitats more than others. A species is found with greatest frequency and abundance in the habitats to which it is best adapted (Crowell 1962). These preferences might change across geographical areas and over seasons. Alteration and destruction of habitats by humans can have a drastic effect on some species, while others adapt to the modified habitat. Therefore, data on the habitat requirements of a species could be useful for predicting the effects of habitat alteration due to humans on natural communities.

Habitat preference of a species might limit its dispersal and subsequent colonisation. It is presumed that species restricted to a habitat would be relatively infrequent in a geographical area and its geographical range would be restricted. Its presence depends on the occurrence of the specific habitat in that area. On the other

hand, generalist species would be common, occurring over a large area (Brown 1984).

This study examines the habitat preferences of 30 species of forest birds on Baratang Island, Andamans, India, and whether there is any relationship between their habitat selection at the local level with broad geographical patterns, such as distribution on the continental mainland and overall status in the Andamans.

STUDY AREA

The Andamans are a part of the Andaman and Nicobar Islands, comprising of more than 300 islands in the Bay of Bengal. They extend from southwestern Myanmar to northwestern Sumatra, lying between 6° 45' and 13° 41' N. They are postulated to be a part of the Arakan Yoma mountain range of Myanmar, which lies submerged. They are considered true oceanic islands as they were never connected to the Asian continent during the Pleistocene glaciation. Maximum overwater colonisation possibly occurred before the Andaman Sea expanded (Ripley and Beehler 1989, Halde *pers. comm.*). The Andaman group consists of four large islands, North, Middle, Baratang and South Andaman Islands, forming a super island of over

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5,000 sq. km with archipelagoes and isolated islands surrounding it. The climate is tropical and oceanic with about 3,000 mm annual rainfall received from both the southwest and northeast monsoons. The dry season extends from February to May.

This study was conducted on Baratang Island, which lies between the Middle and South Andaman Islands. Baratang has been selectively logged and some areas clear felled since the early 20th century; selective logging continues in parts of this island. More than 75% of the sites sampled on Baratang had been selectively logged.

Of the forest types described (Champion and Seth 1968), the common and dominant forms that were considered as distinct habitat types in this study are:

1. Evergreen forest: These are multi-storied climax forest formations that occur mostly on low alluvial land or on moist loamy hillsides, with representative trees such as *Dipterocarpus* spp., *Canarium manii*, *Artocarpus* sp., *Pometia pinnata*.
2. Semi-evergreen forest: Mainly confined to valleys and slopes, containing both evergreen and deciduous trees. Some tree species are *Dipterocarpus alatus*, *Pterygota alata*, *Albizia chinensis*, *Bombax insigne*, *Artocarpus lakoocha* and *Pterocymbium tinctorium*.
3. Deciduous forest: Forests of lower stature growing on lower hills and in drier areas. Common species are *Pterocarpus dalbergioides*, *Terminalia bialata*, *Dalbergia* spp., *Pterocymbium tinctorium*, *Albizia* spp. and *Tetrameles nudiflora*.

The evergreen and deciduous forests are structurally different from each other, especially during the dry season when the deciduous trees lose their leaves. This study was conducted during the dry season (February, March) of 1993.

METHODS

The abundance and habitat use patterns of 30 species of forest birds were recorded in Baratang Island. Approximately half the forested area of Baratang is deciduous and the rest semi-evergreen and evergreen forest. Transects of one km length were laid in each forest type, the number varying with the size of each habitat type. There were 3 transects in evergreen forest, 4 in semi-evergreen forest and 6 in deciduous forest. The transects were walked in the mornings between 0700 and 1000 hrs, and all birds seen and heard were recorded. The identification was based on Ali and Ripley (1987).

To find the habitat preference of a species, the mean number of individuals recorded per km of transect in each habitat was calculated. This eliminates error due to unequal sampling among habitats. Comparison of this abundance index across different habitats gives the relative habitat occurrence of a species (Table 1). Species that were observed with a frequency of more than 60% in at least one habitat are considered common species and are included in the analyses.

From the relative occurrence values, species are placed in the following five categories:

1. Evergreen forest species: Found predominantly in the evergreen forest and less frequently in the semi-evergreen forest.
2. Semi-evergreen forest species: Found in equal proportion in evergreen and semi-evergreen forest, rarely in deciduous forest.
3. Deciduous forest species: Recorded predominantly in deciduous forest and infrequently in other forest types.
4. Moist deciduous species: Recorded in approximately equal proportion in deciduous and semi-evergreen forests, but rarely in evergreen forest.
5. Generalist species: Found in equal proportion in the evergreen and deciduous

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TABLE I
RELATIVE OCCURRENCES OF BIRDS IN VARIOUS HABITAT TYPES ON BARATANG ISLAND

Species	No. of birds recorded	Relative occurrence in each habitat type (%)			Habitat preference
		Evergreen	Semi-evergreen	Deciduous	
<i>Dryocopus hodgei</i>	8	31	69	0	Semi-evergreen
<i>Dendrocopus macei</i>	4	0	0	100	Deciduous
<i>Centropus andamanensis</i>	7	25	0	75	Deciduous
<i>Loriculus vernalis</i>	8	44	56	0	Semi-evergreen
<i>Psittacula eupatria</i>	6	40	60	0	Semi-evergreen
<i>Psittacula alexandri</i>	12	0	23	77	Deciduous
<i>Psittacula longicauda</i>	27	49	44	7	Semi-evergreen
<i>Columba palumboides</i>	4	100	0	0	Evergreen
<i>Ducula aenea</i>	68	49	41	10	Semi-evergreen
<i>Macropygia rufipennis</i>	6	73	27	0	Evergreen
<i>Chalcophaps indica</i>	5	67	33	0	Semi-evergreen
<i>Treron pompadora</i>	10	84	16	0	Evergreen
<i>Irena puella</i>	11	53	47	0	Semi-evergreen
<i>Dendrocitta bayleyi</i>	9	17	50	33	Moist deciduous
<i>Oriolus chinensis</i>	20	25	12	63	Deciduous
<i>Coracina macei</i>	7	25	0	75	Deciduous
<i>Pericrocotus cinnamomeus</i>	20	0	65	35	Moist deciduous
<i>Pericrocotus flammeus</i>	20	62	19	19	Semi-evergreen
<i>Dicrurus andamanensis</i>	14	0	29	71	Deciduous
<i>Dicrurus paradiseus</i>	19	51	39	10	Semi-evergreen
<i>Hypothymis azurea</i>	6	44	33	22	Semi-evergreen
<i>Copsychus saularis</i>	8	22	0	78	Deciduous
<i>Aplonis panayensis</i>	44	0	62	38	Moist deciduous
<i>Sturnus erythropygius</i>	14	0	46	54	Moist deciduous
<i>Gracula religiosa</i>	23	93	7	0	Evergreen
<i>Pycnonotus atriceps</i>	15	54	14	32	Generalist
<i>Pycnonotus jocosus</i>	18	0	16	84	Deciduous
<i>Zosterops palpebrosus</i>	10	31	23	46	Generalist
<i>Dicaeum concolor</i>	11	29	21	50	Generalist
<i>Nectarinia jugularis</i>	9	33	25	42	Generalist

forests, less commonly in the semi-evergreen forest.

The biogeographic distributional ranges of all breeding species present in the Andaman Islands are given in Ripley and Beehler (1989). We ranked each of our study species based on their presence in the four biogeographic regions, with which the Andaman birds have close affinities. Species endemic to the Andaman and Nicobar Is. are given a rank of 1 and for others, the number of regions in which the species is distributed are added to calculate a value. For example, if a species is found in Myanmar,

Sumatra, the Malay Peninsula and in South India, it receives a value of 4.

The rank of each species indicative of its distributional status is taken from Davidar *et al.* (1996). The rank of a species is a composite of its abundance rank, based on the total number recorded, and its distributional rank based on the number of islands on which it was recorded, out of the 45 islands surveyed in the Andamans (Davidar *et al.* 1996).

Rank correlation, contingency table and correspondence analyses were performed to detect any relationship between biogeographic

distributions, status within Andamans and habitat preferences.

RESULTS

The habitat preferences of the 30 species indicate that they occupy a range of habitats, from strictly evergreen or deciduous forest to all these habitats, but in different proportions. Of the 30 species, 12 are habitat specialists, four being limited to evergreen forest, and eight to predominantly deciduous forest. The rest are more broadly distributed; 10 species being classified as semi-evergreen, 4 as moist deciduous and four as habitat generalists (Table 1).

Table 2 provides information on habitat preferences of the species, their biogeographic distributional range and rank indicative of status. Only the relationship between biogeographic range and status is significant (Kendall's $t_b = 0.4305$, $p < 0.01$). This suggests that species with a broad biogeographical distribution are also more common and widely distributed in the Andaman Islands. The habitat preference of species is not significantly related to either biogeographical range or status within Andaman Islands.

DISCUSSION

This study on 30 species of forest birds in Baratang Island indicates that there is a diversity of habitat preference among these species. Approximately half the species studied preferred wet forest, and the rest drier forest. This suggests that the avifauna might fall into two broad categories, those with affinities to wet biogeographic zones on the mainland, and the others of a more deciduous origin. Pigeons and parakeets mostly preferred wet forests in the Andaman Islands, whereas in drier forests no such phylogenetic pattern could be seen.

The results show that there is no relationship between habitat preferences and biogeographic

TABLE 2
HABITAT PREFERENCES, BIOGEOGRAPHIC DISTRIBUTIONS AND RANKING ON RARITY/COMMONNESS SCALE OF 30 SPECIES OF FOREST BIRDS IN THE ANDAMAN ISLANDS

Species	Habitat preference	No. of biogeographic regions ¹	Status rank ²
<i>Columba palumboides</i>	E	1	2
<i>Macropygia rufipennis</i>	E	1	3
<i>Treron pompadora</i>	E	2	6
<i>Gracula religiosa</i>	E	4	6
<i>Dendrocopus macei</i>	D	2	5
<i>Centropus andamanensis</i>	D	1	5
<i>Psittacula alexandri</i>	D	2	6
<i>Oriolus chinensis</i>	D	2	9
<i>Coracina macei</i>	D	3	5
<i>Dicrurus andamanensis</i>	D	1	5
<i>Copsychus saularis</i>	D	4	7
<i>Pycnonotus jocosus</i>	D	3	10
<i>Dryocopus hodgei</i>	S	1	4
<i>Loriculus vernalis</i>	S	3	7
<i>Psittacula eupatria</i>	S	2	5
<i>Psittacula longicauda</i>	S	2	6
<i>Ducula aenea</i>	S	4	9
<i>Chalcophaps indica</i>	S	4	5
<i>Irena puella</i>	S	4	9
<i>Pericrocotus flammeus</i>	S	4	4
<i>Dicrurus paradiseus</i>	S	4	9
<i>Hypothymis azurea</i>	S	4	7
<i>Dendrocitta bayleyi</i>	M	1	2
<i>Pericrocotus cinnamomeus</i>	M	4	9
<i>Aplonis panayensis</i>	M	3	7
<i>Sturnus erythropygius</i>	M	1	7
<i>Pycnonotus atriceps</i>	G	3	2
<i>Zosterops palpebrosus</i>	G	4	9
<i>Dicaeum concolor</i>	G	4	7
<i>Nectarinia jugularis</i>	G	3	10

E = Evergreen, D = Deciduous, S = Semi-evergreen, M = Moist deciduous, G = Generalist.

¹Ripley and Beehler (1989): 1 = endemic to 4 = distributed on four biogeographic regions on the continent

²Davidar *et al.* (1996): 1 = rare to 10 = very common

distributions. Species with narrow habitat use patterns did not correspondingly have narrow distributional range on the continent. Their presence in the Andamans depends, perhaps, on their ability to colonise overwater and not to being

generalised or specialised in habitat use. Ripley and Beehler (1989), in fact, found that there is a disproportionate richness of some phylogenetically related species in the Andaman and Nicobar Islands, and weak dispersers like the passerines are poorly represented.

There is also no relationship between habitat preferences and overall status of species within the Andamans. This shows that species with narrow habitat use patterns are not necessarily uncommon and vice versa. However, species that preferred evergreen forests occurred as rare to moderately common, but did not occur very commonly (maximum status rank 6), whereas species that preferred deciduous forests occurred as moderate to highly common and were never rare (minimum status rank 5). Species with broader habitat preferences generally occurred commonly (status rank above 4, except the Andaman tree pie *Dendrocitta bayleyi* and black-headed bulbul *Pycnonotus atriceps* that occurred only on large islands and were therefore ranked rare). The habitat generalists that use wet and dry forests equally, like the small sized *Zosterops palpebrosus*, *Dicaeum concolor*, and *Nectarinia jugularis*, occurred commonly and have wide biogeographical ranges.

Endemic species did not show any relationship between habitat preference and status. Species like *Columba palumboides* and *Macropygia rufipennis* were evergreen specialists; *Dicrurus andamanensis* and *Centropus andamanensis* were deciduous specialists. Three other endemics used a wider variety of habitats, but none of them were generalist. Similarly, some endemics were relatively rare, e.g., *Columba palumboides* and *Dendrocitta bayleyi*, but others like *Sturnus erythropygius* and *Centropus andamanensis* were

common. However, none of the endemics were very common (median status rank 4). This lack of relationship between habitat preference and status does not conform to the theory that species of wider habitat use are more common than those that are restricted in habitat use (Brown 1984). Lawton (1993) drawing upon empirical data from several studies also found great variation in the conformity to the hypothesis, which predicts a positive correlation between niche breadth, range size and abundance.

Biogeographic distribution and status of species in the Andamans are significantly positively correlated, suggesting that more common species on the island also have a broader distribution on the continent. This pattern does not contradict the general theory on relationship between distribution and abundance (Brown 1984, Lawton 1993) as well as the null model (*sensu* Connor and Simberloff 1979), which proposes that a common species on the continent is more likely to be present in the random subset that colonises an island.

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